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nited States Department of Agriculture,

BUREAU OF ENTOMOLOGY,

L. O. HOWARD, Entomologist and Chief of Bureau.

HARVEST MITES, OR "CHIGGERS."

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Residents of the South and of the more southern portion of many of the Central States, and especially visitors to these sections, are often subject to great annoyance due to the attacks of minute creatures popularly known as "chiggers"[1] and "red bugs," and, incorrectly, as ticks. These pests are the larval or six-legged forms of harvest mites of the genus Trombidium, the adults of which have eight legs. They are troublesome because of their unpleasant habit of burrowing under the skin of human beings. This habit is not normal, and as a consequence the mites die, and their presence under the epidermis gives rise to irritation and inflammation of varying n tensity.

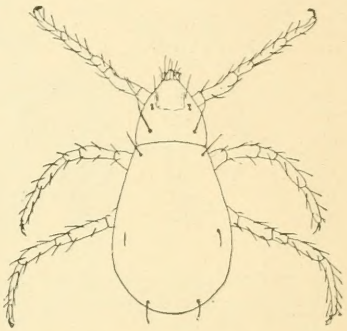

Fig. 1.—*Trombidium:* Larva, highly magnified (from Banks).

For present purposes we may consider the harvest mites as a class. In figures 1 and 2 illustrations of some common forms are furnished. The larval harvest mites are of microscopic size, blood red, and shaped somewhat like a common tick, being nearly as broad in front as behind. They belong to the order Acarina and are not true insects (Hexapoda), but are members of a distinct class (Arachnida) along with ticks, spiders, and the like. The parent mites are predaceous on true insects. As early as 1834 Mr. A. L. Dugès[2] made observations on these mites, which, as previously stated, have six legs in the immature or parasitic stage, while the adults have eight. The adults are of different shades of red and are quite visible. Many persons are familiar with the appearance of the young of certain species,

[1] The name "chigger" or "jigger" is evidently a corruption of chigoe, the pernicious sand-flea (*Sarcopsylla penetrans* L.) of tropical America, a true flea, which crawls under the toe nails of man, producing painful sores which may result seriously if neglected.

[2] Annales des Sciences Naturelles, Vol. I, ser. 1, p. 36; see also P. Megnin, l. c., Vol. IV, ser. 6, pp. 4–20, 1876, and Murray's Aptera, pp. 129–133.

as they occur on the under surface of the bodies of grasshoppers and harvest spiders or "daddy long legs" (Phalangiidæ) and under the wings of the house fly. Just what species of harvest mites are troublesome to man in the United States is not known, but one of them, perhaps the commonest, is referred to in literature as "*Leptus*" *irritans* Riley.[1]

SYMPTOMS AND MANNER OF ATTACK.

Soon after the harvest mite burrows under the human skin a small red spot appears (evidently the mite itself gorged with human blood), after which the surrounding surface becomes congested, the affected area spreading until it is from less than a quarter to a half or three-fourths of an inch in diameter. This congestion may manifest itself within less than an hour after exposure or may not be apparent for twelve hours or so, the fever being at its height usually on the second day. The symptoms are apt to be first noticed when the sufferer has removed his clothing at night, or upon awakening from sleep. It sometimes happens that there is little irritation until some time after exposure, but with most persons susceptible to the poisonous effects of these mites irritation is first experienced on the second day. The feverish appearance of the afflicted skin area varies according to the susceptibility of the person attacked. Children dwelling or sojourning in mite-infested localities suffer greatly from these pests, experienc-

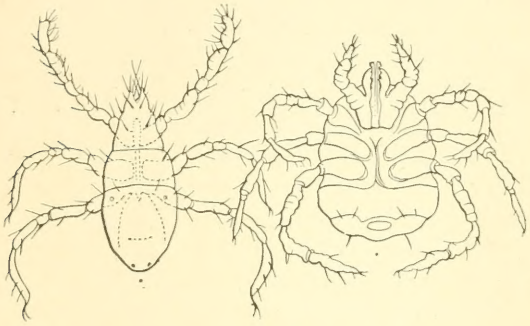

FIG. 2.—*Leptus americanus* at left; *Leptus irritans* at right. Highly magnified, dots under anal extremity indicating natural size (after Riley).

[1] Riley, Poisonous Insects, Extr. Ref. Handb. Med. Sci., Vol. V, 1887, p. 745.

Leptus is a genus founded on the larval Trombidium. For those who may desire further information in regard to the structure of the adult, the following paragraph is transcribed from "A Treatise on the Acarina or Mites," by Nathan Banks (Proc. U. S. Nat. Mus., Vol. XXVIII, pp. 30, 31, 1904), together with a figure illustrating a common species:

The "harvest mites" * * * are recognized by the body being divided into two portions, the anterior (cephalothorax) bearing the two anterior pairs of legs, the palpi, mouth parts, and eyes. The posterior (abdomen) is much larger and bears the two posterior pairs of legs. The mandibles are chelate, at least there is a distinct jaw or curved spine-like process. * * * The body is covered with bristles or feathered hairs, according to the species. The palpi are five jointed, quite prominent, often swollen in the middle, the penultimate joint ending in one or two claws, the last joint (often clavate) appearing as an appendage or "thumb" to the preceding joint. The legs are seven jointed. The tarsi terminate in two small claws. The legs are clothed in the same manner as the body. There are two eyes upon each side of the cephalothorax, quite frequently borne on a distinct pedicel. The genital aperture is situate between the hind coxæ. The anal opening is smaller than the genital and placed a little behind it.

ing more severe annoyance than adults, and young women as a rule suffer more than older persons. People with thin, delicate skin and florid complexion are most afflicted by the mites, and with them the congested red spots are proportionately larger and more inflamed and irritating.

Many persons, however, as, for example, permanent residents of infested regions, and particularly farm laborers, seem to be practically proof against the toxic effects of harvest mites and go with impunity into places overrun with them. This immunity to poisoning is obviously due to two causes: (1) To outdoor work which toughens the person's skin, especially such portions of the arms and legs as are much exposed to the sun and weather; and (2) to inoculation, due to frequent infection.

The inflamed spots due to the presence of the mites under the human cuticle are often diagnosed as hives, nettle-rash, urticaria, or the "weals," and resemble closely those produced on many persons by the "bites" of fleas and some mosquitoes; but on the second or third day each of the mite-infested areas is usually found surmounted at the middle by a minute vesicle or water blister. This is obviously the most important characteristic of harvest-mite attack. After the subsiding of the inflammation and itching, which takes place in a few days, a small scale or scab frequently forms, leaving on some persons a scar which does not wholly disappear in extreme cases for weeks. The mites naturally attack first those portions of the body which are most exposed—those nearest the ground. They crawl into the stockings and penetrate the skin about the ankles, frequently below the shoe tops, and are usually found most numerous below the knee. According to the late Dr. John Hamilton, a physician as well as entomologist, the harvest mites enter the larger sweat tubes or pores of the skin, and as these tubes are very tortuous, the progress of the mites is necessarily slow, from eighteen to thirty-six hours being required for them to reach the end. When the lesions caused by these mites are unusually numerous, the sufferer becomes feverish, and sleep is much disturbed. Sometimes the afflicted one becomes frantic and lacerates his flesh by too vigorous and frequent scratching. Erysipelas is known to follow severe attacks, and death resulting from blood poisoning is recorded. These more serious results of infestation are, however, exceptional and, as with the fatalities which in rare cases follow the ordinarily merely painful or annoying "bites" of many insects, undoubtedly point to an impurity of the blood.

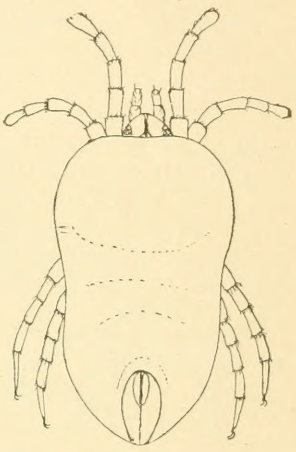

FIG. 3.—*Trombidium:* Adult, highly magnified (from Banks).

HABITAT.

Harvest mites are most abundant in damp locations, along the borders of streams and other bodies of water, and on the edges of forest and woodland. They occur also on trees and shrubbery, evidently affecting the lower surface of the leaves, from which they drop off when these are rudely shaken, and find lodgment on the neck or other exposed parts of the body. Riley describes "*Leptus americanus*" as affecting chiefly the scalp and armpits. In places infested by harvest mites it is a matter of danger to sit down or lie in the grass and herbage for any length of time, as the mites will then have easy access to almost any portion of the body. As a rule these creatures appear to be dependent on the shade and not to live in the direct sunlight, but some forms occur in sunny locations.

These mites are most abundant and troublesome in the Tropics, and become less numerous as we go northward. They are generally distributed in the Gulf States, up the Mississippi River to Missouri and Illinois, and through the Atlantic Coast States to New Jersey. The writer has personal knowledge of their occurence in troublesome abundance as far north as Monmouth County, N. J., near the central line of the State, but they appear to be unknown in New England or north of latitude 40° in the East. It is probable that these mites occur northward of Monmouth County, as there is a report of infestation on Long Island.

During the summer of 1906 more complaint than usual was received of harvest mites, evidently due to the extremely warm and humid weather which prevailed over the districts affected by these pests.

A communication was received August 24 from a correspondent at Oregon, Ogle County, Ill., of a plague of chiggers in that vicinity, on the hillsides of the banks of the Rock River, 200 feet high. This locality is west and a little north of Chicago and is evidently the northernmost point of which we have actual knowledge of the occurrence of these mites at the present time.

Harvest mites are well known in England and Scotland under this name and as "gooseberry bugs." On the Continent of Europe, also, they are abundant, especially in Belgium and the Netherlands, in parts of Germany, and in France. Indeed, in some of these countries they have at times caused considerable annoyance to the peasantry, whom they have hindered or prevented in the harvesting of certain crops. The mites are troublesome, too, in tropical America, in the West Indies, and in Japan.

LIFE HISTORY.

The life history of a harvest mite, as related by Mr. Banks, is substantially as follows: The female lays her eggs in or upon the ground, sometimes to the number of 400 in one place. The eggs are usually

brown and spherical and have been considered by some early writers as fungi. The chlorion or outer skin splits soon after the eggs are deposited, dividing the eggs into halves and exposing the pale vitteline membrane. The larva when hatched is circular or ovoid in outline, and each of its three pairs of legs is tipped with two or three prominent claws. After the larva has become attached to its insect host it elongates and becomes swollen with food. When full fed it drops off, seeks a convenient shelter, and gradually changes in shape without molting. The new parts are formed under the larval skin, which after a few weeks cracks and discloses the adult Trombidium. The mature harvest mite is predaceous, wandering about and feeding on aphides, small caterpillars, and, in the case of one species, on the eggs of grasshoppers or locusts. It hibernates in the soil or in other sheltered locations and in the spring deposits its eggs. There appears to be a single generation produced each year. Only a few forms have been reared. The larva of one occurs commonly on the house fly in autumn.

REMEDIES.

Preventive.—As harvest-mite infestation is usually contracted by walking or working among blackberry and other shrubbery which harbors them, or by walking, sitting, or lying among grasses or similar herbage along streams or pools on the edges of marshes or under trees near such places, it is obvious that the best means of prevention is the avoidance of exposure by susceptible persons. If, however, a bath is taken in hot water, or water containing salt or strong soap, within a few hours after exposure, no ill effects will be experienced. After a longer exposure a bath has practically no effect, and direct remedies are necessary.

Sulphur is a sovereign remedy for mites and is the best preventive of attack. When exposure is unavoidable and where vegetation is not more than 2 or 3 feet high, a sure preventive is found in sifting flowers of sulphur into the underclothes from a little above the knee downward and into the shoes and stockings, or it may be rubbed over legs and ankles. Naphthaline has been successfully used in the same manner in Mexico by Dr. L. O. Howard and in Cuba by Mr. E. A. Schwarz. While the sulphur, being inodorous and perfectly effective, is undoubtedly preferable against harvest mites alone, naphthaline is a safeguard against various forms of man-infesting tropical insect pests. Vaseline, pure or mixed with sulphur, will serve the same purpose, but is not so agreeable on account of its oily nature and the certainty of its soiling the clothing.

For most localities these precautions are to be observed through the months of July, August, and a part of September. The mites are seldom bothersome in early June or as late as October, but in exceptionally warm seasons they are apt to be encountered in both months.

Topical applications.—If exposure has been unwittingly incurred or precautions have been neglected and the characteristic irritation has set in, warning the patient of trouble to come, a counterirritant or cooling lotion should be applied directly to the affected parts. For this purpose moderately strong ammonia, applied when the symptoms are first manifest, has offered the best results, and the writer recommends it above all other direct remedies. Bicarbonate of soda or common cooking soda or saleratus may be substituted in supersaturated solution. Similar alkaline solutions would probably also serve in counteracting the insect poison, which is acid. These substances should be applied liberally until the irritation subsides. Some persons have testified to the value of a 10-per-cent dilution of carbolic acid. Alcohol, camphor, essence of peppermint, and similar preparations are very "cooling," but afford, as a rule, only temporary relief. A dilute tincture of iodine or collodion applied lightly to the affected parts is a good remedy in case of severe suffering. The latter acts by protecting the "sore" spots from the air.

Destruction of the mites in the field.—Much complaint has been made of the presence of harvest mites on lawns and in vegetation in country grounds and along pathways and roadsides, and information has been solicited by many, including officers of country clubs and the like, for methods of eliminating the mites from such locations. This can be accomplished by keeping the grass, weeds, and useless herbage mowed as closely as feasible, so as to expose the mites to the sun. In some cases this can be facilitated by dusting the grass and other plants, after cutting, with flowers of sulphur or by spraying with dilute kerosene emulsion in which sulphur has been mixed. Grasses on the borders of ponds frequented by cattle, wild blackberry bushes, and similar plants should also be cut down and destroyed in the vicinity of houses and where children and older persons are liable to mite infestation by passing through them. Well-cultivated fields kept free from weeds are not infested with "chiggers," and in the course of time, perhaps a year or two, the measures prescribed, if carefully carried out in grassy locations, should also entirely free these from the pests.

Approved:

JAMES WILSON,
Secretary of Agriculture.

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